

Serial No.: 10/611,845
Filed: July 1, 2003

Office Action Date: May 04, 2004
Amendment Date: August 01, 2004

REMARKS/ARGUMENTS

Claim 20 was objected to with the suggestion that the word --degrees-- be inserted after the number "60". Applicants herein present amended claim 20 to comply with the observation and correction requirement in the Office Action.

Claims 1, 5-7, 11, 15-19, 30 and 31 were rejected under 35 U.S.C. 102(b) as being anticipated by USPN 6,336,436 to Miyakubo et al ("Miyakubo"). Specifically regarding independent claims 1, 15 and 30, the Office Action asserts that Miyakubo discloses "providing a closed exhaust valve and a closed intake valve during an intake stroke of said piston *to establish a low pressure condition within the combustion chamber* (See Column 9 Lines 48-54)" (emphasis ours). Claims 1, 15 and 30 recite as follows with bold and italics added to emphasize certain portions for the convenience of the Examiner.:

1. Method of operating a four-stroke internal combustion engine including a variable volume combustion chamber defined by a piston reciprocating within a cylinder between top-dead center and bottom-dead center points and an intake valve and an exhaust valve controlled during repetitive, sequential exhaust, intake, compression and expansion strokes of said piston comprising:

providing an exhaust event during which the exhaust valve is open for expelling combusted gases from the combustion chamber;

subsequent to the exhaust event, providing a period of simultaneous closure of the exhaust and intake valves during at least a portion of the intake stroke of the piston ***effective to establish a sub-atmospheric pressure condition within the combustion chamber***, and,

providing an intake event during which the intake valve is open for ingesting fresh air into the combustion chamber.

15. Method of operating a four-stroke internal combustion engine including a variable

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volume combustion chamber defined by a piston reciprocating within a cylinder between top-dead center and bottom-dead center points and an intake valve and an exhaust valve controlled during repetitive, sequential exhaust, intake, compression and expansion strokes of said piston comprising:

establishing a low pressure event within the combustion chamber during the intake stroke of the piston; and,

establishing a combustion chamber rebreathe event during the intake stroke of the piston by controlling a rebreathe event exhaust valve opening and closing wherein the rebreathe event exhaust valve opening occurs during the low pressure event.

30. Method of operating a four-stroke internal combustion engine including a variable volume combustion chamber defined by a piston reciprocating within a cylinder between top-dead center and bottom-dead center points and at least one intake valve and one exhaust valve controlled during repetitive, sequential exhaust, intake, compression and expansion strokes of said piston comprising:

providing a closed exhaust valve and a closed intake valve during an expansion stroke of said piston;

providing an open exhaust valve and a closed intake valve during an exhaust stroke of said piston;

providing a closed exhaust valve and a closed intake valve during an intake stroke of said piston ***to establish a low pressure condition within the combustion chamber,***

providing an open exhaust valve and an open intake valve during said intake stroke of said piston to ingest combusted gases and fresh air, respectively, into said combustion chamber; and,

providing a closed exhaust valve and a closed intake valve during a compression stroke of said piston.

In contrast, Miyakubo merely teaches a valve shutoff period (minus overlap period) for trapping and compressing EGR gases and injected fuel to effect conditions suitable for subsequent compression autoignition (See Column 10, Lines 14-19). Nowhere does Miyakubo teach or suggest Applicants' methods which are effective to establish the sub-atmospheric or low pressure events or conditions during the intake stroke as claimed. In fact, Miyakubo appears to specifically teach only symmetrical exhaust valve closure (EVC) timing advances and intake

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valve opening (IVO) timing retardation (See e.g.: Column 9, Lines 48-54; FIGS. 13B, 19B and 21C which all illustrate symmetrical EVC and IVO timing relative to piston top dead center (TDC). Such EVC and IVO timing is effective to trap exhaust gases within the cylinder, compress cylinder contents to higher pressures and subsequently relax the higher cylinder pressures to the same degree but is ineffective to establish the claimed sub-atmospheric or low pressure events or conditions of the present invention. Miyakubo simply does not teach or suggest, and is in fact silent with respect to, establishing the sub-atmospheric or low pressure events or conditions during the intake stroke as claimed by Applicants.

Anticipation must be based on a single reference that describes the subject matter claimed in the patent with sufficient detail and clarity to demonstrate that the subject matter existed and that a person of ordinary skill in the art would have recognized its existence in the asserted prior art reference. ATD Corp. v. Lydall, Inc., 159 F.3d 534, 545 (Fed. Cir. 1998). A prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently, to anticipate. In re Schreiber, 128 F.3d 1473, 1477 (Fed. Cir. 1997). If all the elements are not expressly stated in a single reference, a claim may only be anticipated if non-disclosed elements would have been inherent in the prior art. And, under the principals of inherency, the prior art must necessarily function in accordance with, or include the claim limitations; it anticipates. Telemac Cellular Corporation v. Topp Telecom Inc., 247 F.3d 1316 (Fed. Cir. 2001) relying on MEHL/Biophile Int'l Corp. v. Milgraum, 192 F.3d 1362, 1365 (Fed. Cir. 1999).

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For the above reasons, Applicants respectfully traverse the anticipation rejection in view of Miyakubo under 35 U.S.C. 102(b) of claims 1, 5-7, 11, 15-19 and 30. Miyakubo does not anticipate, expressly or under the principals of inherency, Applicants' invention as claimed.

Additionally and specifically regarding claims 5-7 and 11, Miyakubo does not disclose "a rebreathe wherein said exhaust valve is open during at least a portion of the intake event" as set forth in claim 5 from which claims 6, 7 and 11 also depend. Miyakubo teaches exhaust gas recirculation by trapping residual combusted gases in the cylinder by early or advanced EVC. Nowhere does Miyakubo teach or suggest a rebreathe (i.e. exhaust gas re-ingestion) event as claimed by Applicants which requires an exhaust valve opening during the intake event (which is in addition to the exhaust valve opening for expelling combusted gases as found in claim 1 from which claim 5 depends). In fact, Miyakubo's only teaching of an exhaust valve opening is with respect the exhaust event opening for expulsion of exhaust gas.

For the additional above reasons, Applicants respectfully traverse the anticipation rejection in view of Miyakubo under 35 U.S.C. 102(b) of claims 5-7 and 11. Miyakubo does not anticipate, expressly or under the principals of inherency, Applicants' invention as claimed.

Additionally and specifically regarding claims 16-19, Miyakubo does not disclose "said low pressure event is established by controlling phasing of an exhaust event exhaust valve closure and the intake valve opening" as set forth in claim 16 from which claims 17-19 all depend (claims 18 and 19 through intervening claim 17). As previously described, Miyakubo merely teaches a valve shutoff period (minus overlap period). And, Miyakubo specifically teaches only symmetrical exhaust valve closure (EVC) timing advances and intake valve

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opening (IVO) timing retardation ineffective to establish the claimed sub-atmospheric or low pressure events or conditions of the present invention.

For the additional above reasons, Applicants respectfully traverse the anticipation rejection in view of Miyakubo under 35 U.S.C. 102(b) of claims 16-19. Miyakubo does not anticipate, expressly or under the principals of inherency, Applicants' invention as claimed.

Claims 2-4, 8-10, 12-14, 21-29, 32-36 were rejected under 35 U.S.C. 103(a) as being unpatentable over Miyakubo in view of design choice. Specifically, the Office Action asserts that "the various particular pressures, lift ranges and angular ranges would have been an obvious matter of design choice well within the level of ordinary skill in the art depending on design variables such as engine load and speed requirements. Moreover, there is nothing in the record which establishes that the claimed applied forces presents a novel or unexpected result." (citing In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975)).

Obviousness conclusions based on a single reference must be supported by some suggestion or motivation to modify the teachings of that reference. In re Werner Kotzab, 217 F.3d 1365 (Fed. Cir. 2000). In Kotzab, the Court observed that such suggestion or motivation "may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved." For the reasons above explaining the failure of Miyakubo to teach or suggest establishment of sub-atmospheric or low pressure events or conditions central to all of Applicants' claims, Miyakubo also fails to provide an adequate basis for a prima facie obviousness rejection in as much as those key claim limitations fail to be set forth expressly or inherently therein. Nor has the Office Action has

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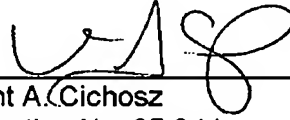
proffered any suggestion or motivation in the prior art for providing the sub-atmospheric or low pressure events or conditions required by Applicants claims and absent from Miyakubo. Nor does Miyakubo does not disclose or suggest establishment of any sub-atmospheric or low pressure event or condition of the present invention and does not suggest more specific chamber pressures of any particular measure or metric. And, the teachings and suggestions of Miyakubo are directed toward the establishment of trapped exhaust gases within the cylinder, compression of cylinder contents to higher pressures and subsequent relaxation of the higher cylinder pressures to the same degree. But, Miyakubo is ineffective to suggest or motivate one skilled in the art toward the establishment the claimed sub-atmospheric or low pressure events or conditions of the present invention. It is therefor an unsupportable extension of Miyakubo then to provide the basis of any design choice conclusions with respect to the various specific chamber pressures, valve lifts and angles to establish such sub-atmospheric or low pressure events or conditions in accordance with the present invention set forth in claims 2-4, 8-10, 12-14, 21-29 and 32-36. Such design choices presupposes the alleged anticipatory value of Miyakubo which Applicants have successfully traversed. Nor has the Office Action provide any basis from the prior art or one skilled in the art to support such naked conclusions and should such alleged basis be maintained Applicants require sufficient documentation to support such conclusory statements.

Applicant verily believes that the presented claims as presently amended or originally presented as the case may be are in condition for allowance. Applicants therefor respectfully request that all claims 1-36 as presented herein be allowed to proceed to issue.

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Respectfully submitted,



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